first place the fluid is absolutely unpotable; and secondly, nearly all the known species of *Nepenthes* grow in climates where the traveller need never be thirsty. Mr. Burbidge states that on the great mountain range of Kina Balou, in North-west Borneo, the "paradise of pitcher-plants," there is a deluge of rain every night in the year, while in the day-time the air is in a constant state of "Scotch mist." The internal surface of the pitcher is provided with a large number of specialised glands, from which the secretion is poured out into the pitcher. The fluid has a slightly acid reaction, and yields a large quantity of solid matter on evaporation; and the most trustworthy analyses that have been made show that the preponderating unorganised constituents are potassium chloride and malic and citric acids, with smaller quantities of soda, lime, and magnesia. The researches of Vines have convinced him that the pitcher secretes an enzyme which has the property of digesting organic substances in the presence of an acid which is always found in the fluid; and that this digestion is not due to the putrefactive bacteria which are always present in the liquid. All the species of *Nepenthes* are either epiphytic or grow in wet soil, and agree with other carnivorous plants, such as *Drosera* and *Dionæa*, in having a very reduced root-system; the food-substances obtained through the pitchers thus supplying the lack of nutriment from the soil.

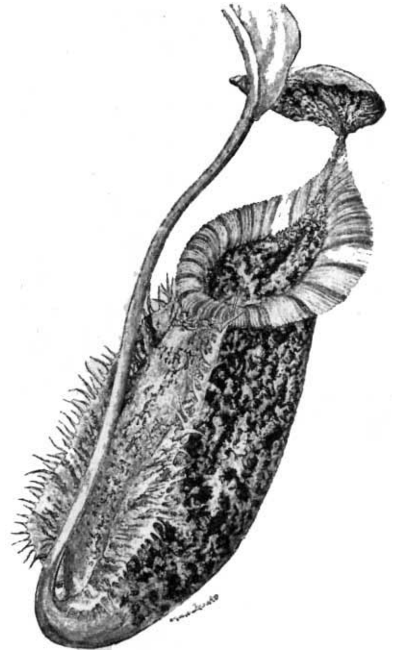

FIG. 2.—Pitcher of *Nepenthes Dicksoniana*, one-fourth natural size.

None of the other pitcher-plants, with the possible exception of *Cephalotus*, are, according to Vines, truly carnivorous. In most cases they are insect-traps, but they produce no digestive enzyme; the captured insects are decomposed by the microbes which abound in the fluid, and the products of decomposition absorbed by the plant. In *Darlingtonia*, and in *Sarracenia*, one species of which, the "Side-saddle-plant," is abundant in bogs in the Northern United States and in Canada, the lid is replaced by a hood, and insects are attracted by honey-glands placed near the mouth of the pitcher. In *Dischidia* the pitcher, which has no lid, is not nutritive; its main use appears to be to husband the water required by the plant. The pitchers of *Cephalotus* closely resemble in appearance those of *Nepenthes*. Several species of *Utricularia*, or Bladder-wort, are among the prettiest of our water-plants, with their pale yellow flowers and much-divided leaves, ornamented with the minute bladders, which are closed by a valve opening inwards, thus preventing the escape of innumerable aquatic animals which creep into them. It may be added in conclusion that one of our few native non-chlorophyllous root-parasites, the Tooth-wort (*Lathræa squamaria*), belonging to the Scrophulariaceæ, has singular hollow underground scale-leaves, which may be regarded as rudimentary pitchers, and resemble those on the exotic terrestrial species of *Utricularia*. Their purpose appears to be the reverse one to that of the pitchers of *Dischidia*, viz. to serve as organs for the excretion of superfluous moisture.

Our illustrations are taken from Mr. Veitch's paper on *Nepenthes* in the *Journal* of the Royal Horticultural Society. Fig. 1, a hybrid known as *N. Sedenii*, a cross between *N. Khasiana* and an unknown species, shows the general habit of the genus. Fig. 2 represents the magnificent pitcher of *N. Dicksoniana*, a cross between *N. Rafflesiana* and *N. Veitchii*. In Fig. 3, *N. Edwardsiana*, Hook. f., a spike of male flowers is shown; also a magnified portion of the glanduliferous surface of the pitcher.

A. W. B.

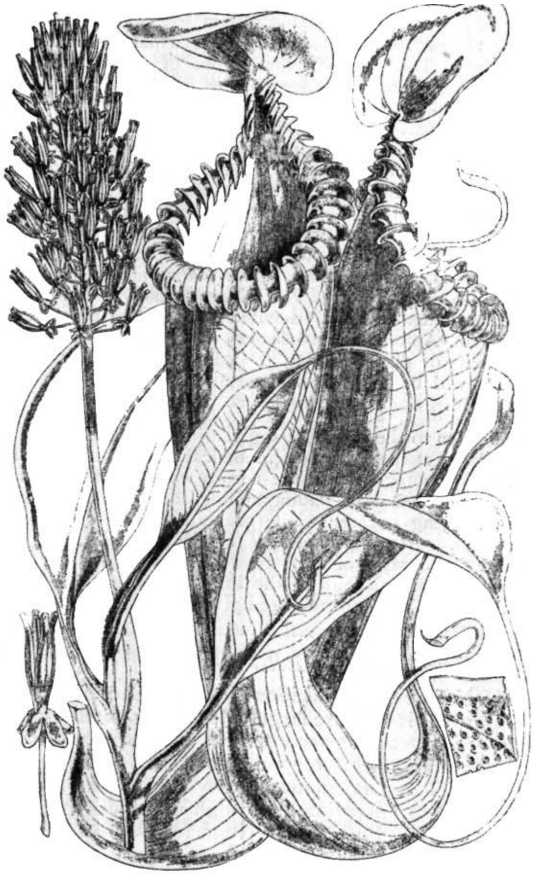

FIG. 3.—*Nepenthes Edwardsiana*.

A NEW ARTILLERY CHRONOGRAPH.[1]

THE ordinary chronograph used in artillery experiments consists of a falling shutter held suspended by an electromagnet whose circuit is broken by the projectile, which cuts a wire in its passage. Other wires are cut at intervals along the path of the projectile, and as each one is cut a knife is liberated which strikes the shutter and imprints a mark upon it. These marks form a record of the speed of the ball in terms of the known speed of a falling body.

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[1] Based upon an article in *La Nature*, pp. 97 and 122, 1898.

This apparatus, which has been perfected by many devices, is open to a fundamental objection. The release of the shutter and of the knife takes time, a short time may be, but an amount of time which becomes objectionable when intervals as small as one-twentieth of a second have to be dealt with. Projectiles nowadays attain velocities of half a mile per second, and a new and more accurate means is required for dealing with them.

Such an instrument has been devised by Prof. Cushing Crehore, of Dartmouth College, and Mr. Owen Squier, lieutenant of artillery in the United States Army. It is based upon an electro-optical principle of comparatively recent discovery, that known as the Faraday effect. When a beam of light is polarised by a Nicol prism and then sent through another Nicol prism, it is transmitted if the polarisation planes of the two prisms are parallel, but is totally extinguished if the planes are crossed. If, however, a tube containing carbon bisulphide or other rotatory substances is interposed between the crossed Nicols, the light reappears as soon as the tube is exposed to a strong magnetic field. This magnetic field is produced by a coil of wire surrounding the tube, and hence it will be seen at once that an electrical contrivance is possible which interrupts or restores the beam of light. Add a photographic recording apparatus, and the scheme underlying the Crehore-Squier arrangement is complete.

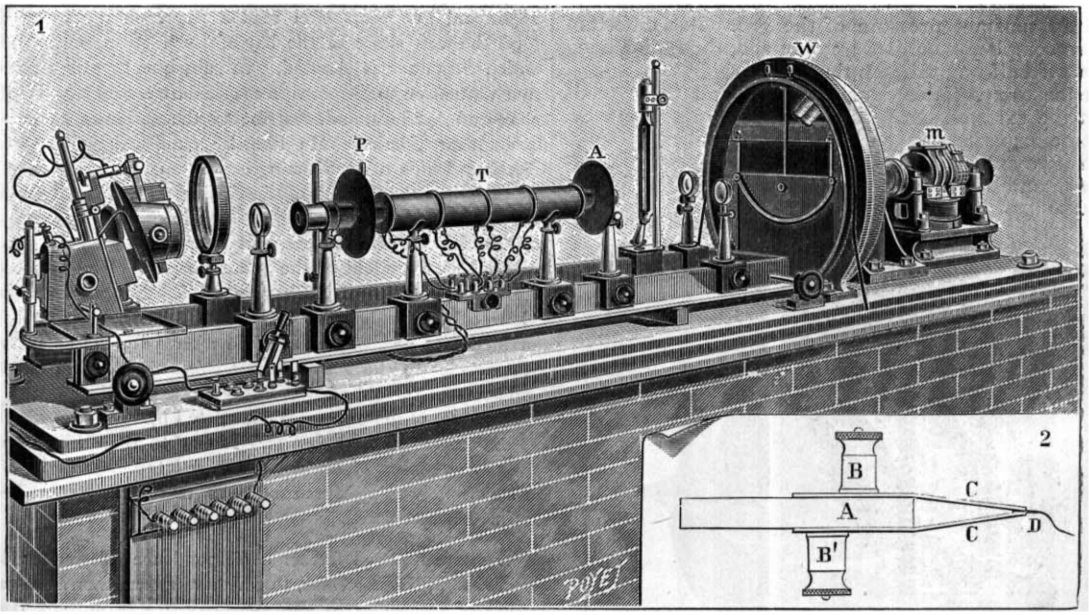

FIG. 1.—Recording apparatus. T tube containing carbon bisulphide surrounded by magnetising coils. W camera. No 2, arrangement for closing circuit.

The recording apparatus is shown in Fig. 1. P is the polarising Nicol, A the analyser, T the tube containing the carbon bisulphide and surrounded by the magnetising coil. W is the camera containing the revolving sensitive plate driven by the small motor *m*. The camera is provided with a falling shutter which covers a thin brass disc provided with two small openings. One of these openings admits the polarised light. The other admits light which has had to pass through a hole in a piece of aluminium foil carried on the prong of the vibrating tuning-fork shown in the figure. The vibrations interrupt and restore the light at perfectly constant known intervals, and make a record of dots on the plate, which serve to determine the time for the projectile record. The falling shutter serves to limit the exposure to a portion of one revolution of the plate, and to prevent the superposition of records.

The projectile, in starting from the mouth of the cannon, breaks the first wire and the magnetising circuit, thus extinguishing the light. When it reaches the second wire, it restores the circuit in a manner explained by No. 2 (Fig. 1). B and B' are terminals of the circuit, A is an insulating piece, and C C are elastic metallic plates kept apart by the insulated wire D. The projectile in its passage whips out the wire D, and allows C C to touch and establish the circuit. The next wire breaks it again, the next restores it, and so on. In the figure, four circuits are indicated, which may be brought into play one after the other, thus providing for the measurement of eight time intervals. By placing these wires at suitable distances from the cannon's mouth, any portion of the path may be minutely investigated.

The most striking information derived from such measurements is that the speed of the projectile goes on increasing for some time after it has left the cannon's mouth. Starting with a muzzle velocity of about 480 m. per second, the projectile increases its speed to, say, 515 m. per second in traversing the first 6 feet from the mouth. It is only after having travelled some 25 yards that the projectile is reduced to its original muzzle velocity. This proves that the impulse of the expanding gas is felt some distance along the path of the projectile.

By a modification of the arrangement described, the inventors have also succeeded in determining the speed of the projectile inside the barrel of the gun. For this purpose they secured a wooden lath to the cone of the projectile (Fig. 2), provided with rings of metal at decreasing intervals. These rings were connected among themselves and to the projectile by a wire running along the length of the rod, the whole being smoothed and turned into an accurate cylindrical shape. A wooden block, A (Fig 3), was fastened on the muzzle of the gun by means of screw clamps, and a brass collar with steel rings, C, was made to embrace the rod, which in the original position of the projectile just projected from the muzzle.

A circuit through the steel rings, the brass collar, the metallic rings on the rod, the projectile and the body of the gun was completed whenever the brass collar touched one of the rings on the rod. It was broken when the wooden portions passed, and so an alternate transmission and extinction of the polarised beam was brought about, which served the same purpose as in the arrangement first described. The curves obtained showed a constant acceleration of the projectile within the barrel, which would indicate a constant pressure of the gas. But unfortunately no complete records were obtained, the rods having broken off half-way through the barrel.

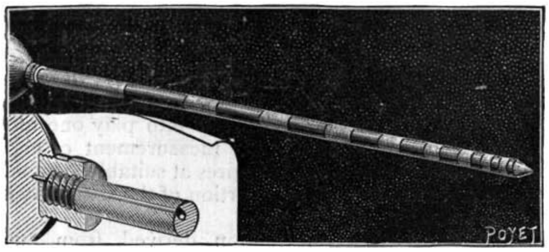

FIG. 2.—Apparatus for measuring velocity of projectile inside the barrel.

The most remarkable circumstance of all these trials lies in the extreme smallness of the intervals measured. In some experiments ten points were taken along a length of 72 cm., which corresponds to a duration of 0·005 seconds, and reduces the interval observed to 0·0005 seconds.

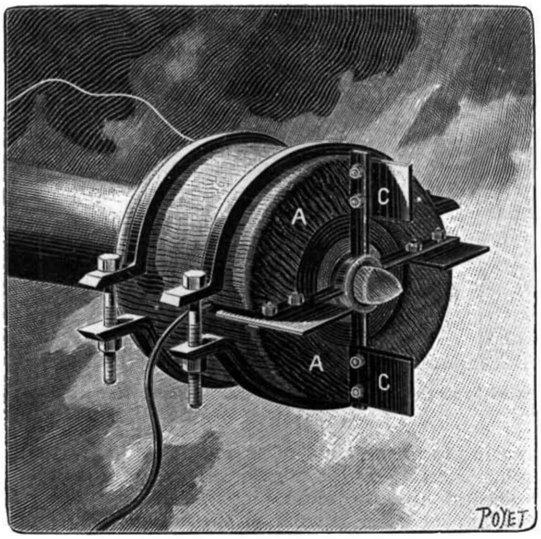

FIG. 3.—Block attached to muzzle for making circuit.

Needless to say, the apparatus may with equal success be applied to other fields of micro-chronographic investigation.

NOTES.

At the meeting of the Royal Society next Thursday, February 24, for the discussion of the scientific advantages of an Antarctic expedition, the following are likely to take part in the discussion which will be opened by Dr. John Murray:—The Duke of Argyll, Sir Clements Markham, Sir Joseph Hooker, Sir Archibald Geikie, Dr. Neumayer (Director of the Deutsche Seewarte), Dr. Sclater (Secretary of the Zoological Society), Prof. D'Arcy Thompson, and others.

PROF. ALEXANDER AGASSIZ writes to Prof. Ray Lankester from Sura, Fiji, under date January 3, as follows: "I got here first days in November, and found my steamer awaiting me; started the day after reaching Sura, and have been on the full run ever since. I have learned more about coral reefs than on all my former expeditions. Naturally my experience elsewhere has been of great service. The problem is getting more and more complicated. My boring was a fizzle. I only got to 80 feet; but in a region where there are elevated reefs nearly 1000 feet thick, that means nothing. From all I hear about the Funafuti boring (700 feet), and from what Prof. David writes, I fancy the bore-core will not bring us any nearer to a conclusion. It certainly can not help us to ascertain how atolls have been formed."

THAT until a few days ago (February 10) there lived in Eaton Square a nephew of Sir John Moore, and a man who many years ago attained a considerable distinction in geology, was little known to the present generation of scientific workers. John Carrick Moore was born in 1804, and inherited an estate in the northern part of The Rhinns of Wigtownshire, near Stranraer. He became a Fellow of the Geological Society in 1838, and two years later read a paper on the rocks which form the west shore of the bay of Loch Ryan, at the head of which Stranraer is situated. In subsequent years he devoted much attention to the fossiliferous Silurian strata of Wigtownshire and Ayrshire, and contributed the earliest account of the rocks near Carrick. He likewise published accounts of the Tertiary fossils of St. Domingo and Jamaica. For many years he served on the Council of the Geological Society, terminating his official connection in 1875. In 1846 he was appointed one of the Honorary Secretaries, and later on for several years he was a Vice-President of the same Society. He was elected a Fellow of the Royal Society in 1856. Educated at Queen's College, Cambridge, he early gained a sound knowledge of mathematics and physics, and in after years he contributed a few articles to the *Philosophical Magazine*, dealing with the influence of the obliquity of the ecliptic on climate, and criticising some of the principles enunciated by Ramsay with regard to the erosion of lake basins. Living to the advanced age of over ninety-four, Moore long outlived the majority of his old friends, of whom Murchison was one with whom he was intimately associated.

WE have received further correspondence relating to the two Societies in Lincolnshire, to which reference was made in our issues of December 30 and February 3. It appears that the older Society, the Lincolnshire Naturalists' Union, does not regard with unmixed friendliness the newer and possibly more vigorous Science Society. Into this unfortunate conflict of interests it is not our province to enter, and we can only repeat with renewed emphasis that it is a most serious mistake to allow the spirit of rivalry to enter into the matter at all. The welfare of both Societies can only suffer, and the progress of science in the county can only be retarded by friction. The Lincolnshire Science Society explains its origin by accusing the Union of failing to carry out the objects for which it was founded. There may or may not be truth in the accusation, but we are bound to admit that evidence of scientific activity on the part of the Union has not been obtainable. We cannot find the latter body among the corresponding societies of the British Association; neither can we learn that any publication has been issued under its auspices. Attention may be called to an article by Prof. Meldola, on the work of local societies, published in these columns in 1896 (vol. liv. p. 114), in which some of the causes of the decay of such societies are pointed out, and the advantages of federation insisted upon. We can only hope that Lincolnshire will not present to the scientific world a divided front on a